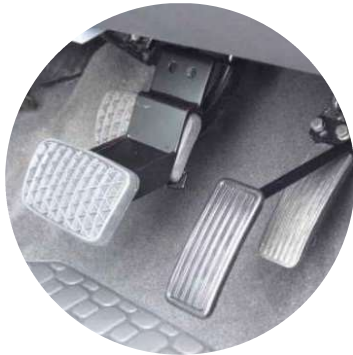
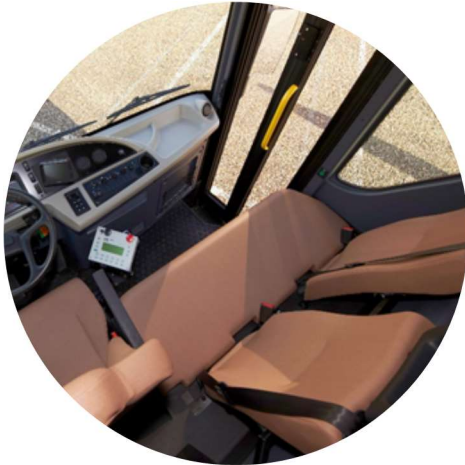


Safe Fleet Transition Plan Update 2018 - 2019

Best Practice Technologies and Processes

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NYC DCAS

Citywide Administrative Services

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John A. Volpe National Transportation Systems Center

Volpe

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Safe Fleet Transition Plan Update for 2018-2019

November 2018

Introduction

The New York City Department of Citywide Administrative Services (DCAS) operates the largest municipal fleet in the United States with over 31,000-vehicles. As a leader of potential broader adoption of life-saving safety technologies in the general fleet, DCAS adopted a New York City Safe Fleet Transition Plan (SFTP) in 2017-2018. The SFTP formalized a set of best-practice vehicle safety technologies for all City vehicles to prevent and mitigate crashes, in direct support of Vision Zero. The U.S. Department of Transportation’s (USDOT) John A. Volpe National Transportation Systems Center (Volpe) partnered with DCAS to broadly research these technologies and to develop best practice information for the 2018 – 2019 update cycle.

The SFTP’s sustained progress in reducing crashes depends on cross-agency communication, agency willingness to pilot new safety technologies, working closely with private industry including both vehicle manufacturers and private fleets, including other municipalities and organizations in advancing safety technologies, and regular revision of the Plan itself. As technologies and techniques for fleet safety evolve with time, the SFTP should be reviewed and revised annually by DCAS in conjunction with the Fleet Federation agencies. This report presents proposed 2018 – 2019 revisions and updates that may be incorporated into the SFTP.

Potential New Technology Designations

Reflecting changes in the state of the art, the current fleet safety technology market, and input from DCAS and the ten fleet agencies shown in **Error! Not a valid bookmark self-reference.**, this section presents the potential new tiered technology table for the SFTP in 2018-2019. DCAS would also like to acknowledge Together for Safer Roads and their member companies for investigating the adoption of some of the same vehicle safety technologies into their vehicles as well as benchmarking with DCAS the technologies currently being used in their fleets.

Table 1. Fleet agencies consulted in the development of this proposed SFTP update memo.

Abbr.	Department Name
DEP	Department of Environmental Protection
DOC	Department of Corrections
DOE	Department of Education
DOHMH	Department of Health and Mental Hygiene
DOT	Department of Transportation
DPR	Department of Parks and Recreation
DSNY	Department of Sanitation
FDNY	Fire Department
NYPD	Police Department
TLC	Taxi and Limousine Commission

Technologies that are proposed to be added, promoted, demoted, split, or consolidated are shown in **bold** typeface in Table 2. A discussion of each bolded entry is provided in the following sections. In

addition, a number of non-bolded entries are clarified or updated in the “Other Considerations” section that follows.

Table 2: Proposed updated technology designations

Tier 1	Tier 2	Tier 3
	Best Practice Technologies	Exploratory Technologies
High vision truck cabs where competitively available and operationally feasible * [§]	Pedestrian AEB for medium- and heavy-duty vehicles where available (Class 3-8) * [§]	Alcohol touch ignition interlock [§]
Additional mirrors/lenses where applicable including Fresnel lenses *	Blind spot monitors	Cell phone physical or app-based lock box/ docking station ignition interlock [§]
Appropriate technologies and techniques to see behind vehicle, such as but not exclusive to backup cameras	Enhanced Seat Belt Reminder systems (ESBRs)	Seatbelt assurance ignition interlock systems [§]
Forward Collision Warning (FCW) and Pedestrian Collision Warning (PCW) for Class 1 and 2	Navigation systems	Surround cameras *
Automatic Emergency Braking (AEB) for light-duty vehicles (Class 1-2) with Advanced Pedestrian Monitoring as preferred option where available [§]	Power mirrors and heated mirrors *	Turning alarms *
Automatic headlights where available	Speed governors * [§]	Universal design
Enhanced truck rear underride guards *	Connected vehicle, or vehicle-to-vehicle (V2V), communication technology	Rear Automatic Emergency Braking (AEB) for light-duty vehicles (Class 1-2) [§]
Safety lights for work trucks, such as but not exclusive to side-visible turn signals and roadwork lights (amber)	Broadband backup alarms †	Intelligent Speed Assistance (ISA) [§]
Side underride guards * consistent with Local Law	Rear Automatic Emergency Braking (AEB) for heavy-duty vehicles with air brakes * [§]	Automatic Emergency Braking (AEB) for medium- and heavy-duty vehicles (Class 3-8) * [§]
Self-adjusting volume backup alarms †	Forward Collision Warning (FCW) and Pedestrian Collision Warning (PCW) for Class 3 and above	
Telematics to enable utilization, collision, speed, and safety reporting, among other uses	External Cameras and Recording	
Warning decals *	Training where feasible in appropriate use of technologies	

Note: Entries in **bold** are potential updates for 2018 (see explanations below)

* = Only apply to vehicles with gross vehicle weight rating of 10,000 lbs. or greater.

† = Only apply to vehicles with limited or no direct rear vision (e.g., passenger/cargo vans and trucks) and to vehicles **and trailers** with gross vehicle weight rating of 10,000 lbs. or greater.

§ = Only apply to non-emergency response vehicles

High-Vision Truck Cabs

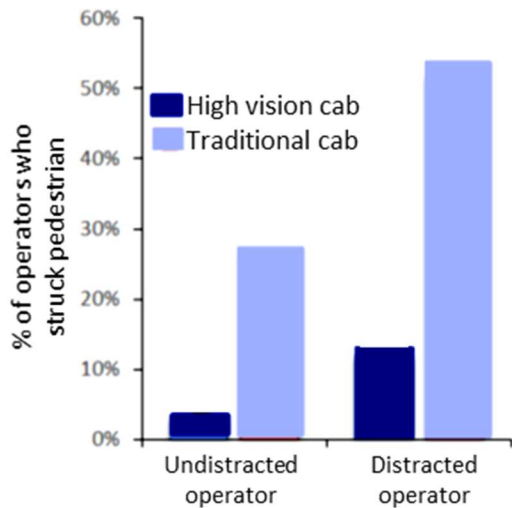
This update proposes to elevate high-vision truck cabs to Tier 1. While recognizing the challenges with increasing direct vision from truck cabs, DCAS has reviewed Volpe’s research of best practices, and as a result DCAS has decided to recommend elevating high-vision truck cabs to Tier 1 and believes this would encourage the increased availability and feasibility of high vision truck cabs.¹

Direct vision trucks are currently used by DSNY for some waste collection trucks. There are many truck applications where direct vision is not yet available or available in sufficient models to enable competitive procurement. DCAS will assess the marketplace for each truck application to determine whether this requirement can be sustained in each area and will also meet with truck suppliers to help spearhead this design advance. As in London and Europe, this change will require a transition period for industry to adapt. DCAS will only require the high vision specification where it can be competitively procured and is operationally feasible

Heavy-duty vehicles are less maneuverable and typically take longer to stop than light-duty vehicles. As a result, reducing driver reaction time is a key tool to improving safety. Direct vision improvements reduce a vehicle’s blind spots and increase a driver’s direct field of view in the area near the vehicle, helping the driver to see other road users and to avoid collisions. Improved truck (and to a lesser degree bus) cab direct vision was a top-cited issue and desire in discussions with the agency fleets.

¹ <https://tfl.gov.uk/info-for/deliveries-in-london/delivering-safely/direct-vision-in-heavy-goods-vehicles>

**Operators struck simulated pedestrians
~80% less often in a high vision truck cab**



**Operators reacted to stop for a pedestrian
~50% faster through direct vision**

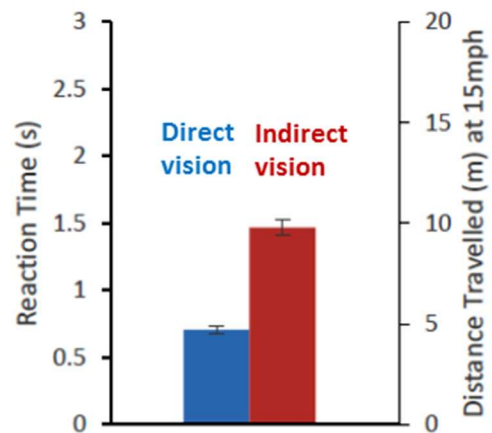


Figure 1. Left: Increase in crashes with pedestrians when using a traditional cab versus a low-entry, high vision cab. Right: Improved driver response time for direct compared with indirect vision. Right (Source: TfL).

In a University of Leeds Study commissioned by Transport for London, the number of drivers in the study who struck simulated pedestrians was about five times greater in traditional truck cabs than in low-entry, high-vision cabs. When the drivers—which included professional truck drivers—were required to perform a mental task while operating, more than half of the drivers in traditional cabs struck pedestrians, compared to only about 12% of high vision cab drivers.

Whereas other vision-enhancing mechanisms—e.g., mirrors, lenses, cameras, and sensors—are intended to compensate for poor direct vision, and will be maintained as Tier 1 technologies in this SFTP, high-vision cabs allow drivers to better see adjacent roadway, pedestrians, cyclists, and other road users with their naked eyes. This minimizes the complexity and fatigue potential of processing multiple inputs, reduces new blind spots created by the installation of mirrors, and facilitates eye contact with people to communicate awareness and intent through facial or hand signals. NHTSA recommends that pedestrians and bicyclists make eye contact with drivers to help ensure that they have been seen,² and research has found that eye contact with drivers can significantly reduce drivers’ speed approaching a crosswalk.³ However, this is only possible if the vehicle cab design permits eye contact.

There are several key components of high-vision cab design that distinguish it from traditional cab design:

- Cab-over or cab-forward design, wherein the driver sits forward of the front axle (versus conventional cab design wherein the engine and front axle are forward of the driver)
- Lower driver seat height from the ground and lower dashboard height relative to the driver’s eye

² <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/ped-t.pdf>

³ <https://www.sciencedirect.com/science/article/pii/S1877705816003015>; <https://www.wsj.com/articles/the-key-to-crossing-the-street-safely-eye-contact-1427734205>

- height to allow a more complete view of surroundings
- Increased glazing and lower beltline relative to the driver's eye height throughout the cab body and doors.

While the SFTP is intended for new City vehicles, the retrofitting of some vehicles as a pilot to ascertain costs, benefits, and effort may also be of value. Certain direct vision improvements can be retrofitted onto existing fleet vehicles, while others must be specified in the purchase of new vehicles, in some cases at no added cost. As shown in



Figure 2 and the visual catalog in the following figures, retrofits and short- and long-term procurements can be combined to create meaningful safety improvements incrementally:

- Peep and Teardrop Windows
- Sloped-hood Cabs
- Cab-Over Engine Designs
- High Vision Cabs (combines low-entry cab-over & window enhancements)

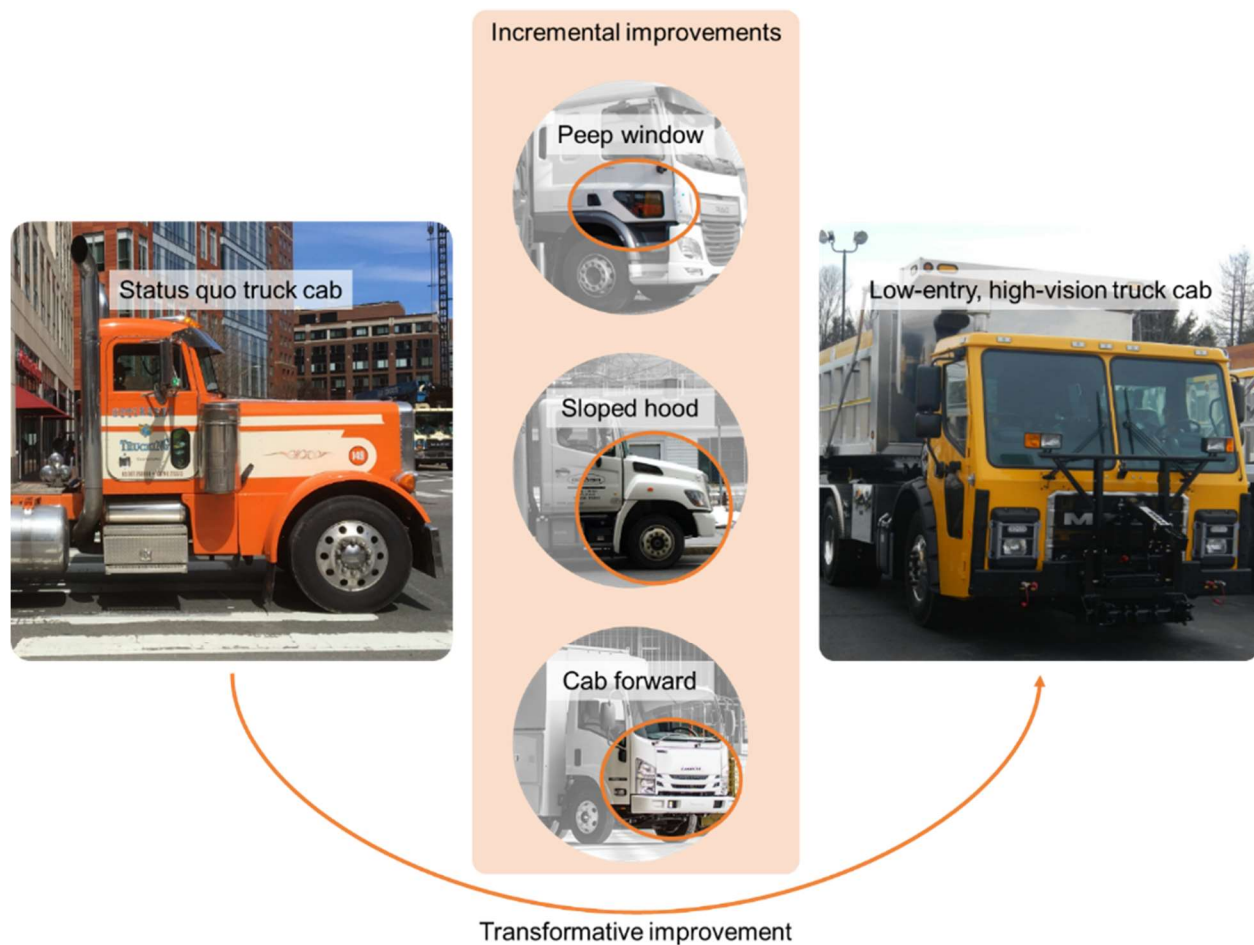


Figure 2: Progression from a low vision truck cab to a high vision truck cab can be incremental or transformative.

When selecting vehicle models to increase the drivers’ direct vision, agency fleets may be constrained by current DCAS or agency specifications and vendors. Additional work is likely needed to revise current specifications and to expand the vendor pool. Per feedback from agencies, there is an opportunity to engage OEMs on the future designs of truck/bus/van cabs and to demand elements of high-vision design. There are also immediate opportunities, as a number of agencies indicated, to convert from conventional cab to available cab-over models. Implementation requires the ability to compare the degree of vision provided by different vehicles to select the highest vision models currently available in the U.S. Table 3 provides a high-level overview of representative models that may provide distinct levels of improved direct vision.

Table 3. Implementation strategies and example vehicle models for improved direct vision.

Implementation Strategy	Direct Vision Element	Example Vehicle Models
Transformative (“best in class”)	<i>Low-entry cabover (“high vision cab”)</i>	Freightliner EonicSD; Eagle ProView; Mack LR; Volvo FE LEC ⁴
Incremental	<i>Cab-forward/cabover</i>	Isuzu NPR; Mitsubishi Fuso; Mack MR; GMC T7500; Kenworth K370

⁴ <https://www.volvotrucks.com/en-en/news/volvo-trucks-magazine/2018/aug/a-clearer-view.html> (not in U.S. yet)

	<i>Sloped hood</i>	HINO 338; Freightliner M2 106; Thomas Saf-T-Liner C2
	<i>Peep and teardrop windows</i>	Various makes and models



Figure 3: High-vision cabs expand near-vehicle visibility for drivers

To quantitatively compare direct vision between truck models, DCAS and Volpe have identified a measurement system developed by the Franklin W. Olin College of Engineering with oversight from Volpe that is available to be utilized as a possible tool to assist in evaluation. The Visibility in Elevated Wide vehicles (VIEW) method relies on a low-cost, app-based analysis of panoramic photos collected from the driver's seat using a standard smartphone. As with all SFTP items, DCAS will determine whether any given specification is compliant based on the SFTP and in consideration of existing technology options and limitations.



Figure 4: Example available high vision cab model: Freightliner EconicSD



Figure 5: Example available high vision cab model: Dennis Eagle Proview



Figure 6: Example high vision cab model implemented as a mixer: Mercedes Benz Econic, equivalent to Freighliner EconicSD



Figure 7: Example available high vision cab model: Mack LR. However, note that the A pillars and associated blind spots appear wider than the other other low-entry cabover examples.

Specification writers may choose to develop both incremental and longer-term cab specifications based on agency timeline, availability, and cost constraints. For example, Mack LR, Dennis Eagle ProView, and Freightliner EconicSD appear to be leading candidates for best-in-class direct vision today, but agencies may find they need to encourage these manufacturers to offer more types of truck bodies on such chassis—not just waste collection bodies. Other low entry cab over models may become available in the future as well (e.g., the Volvo FE low entry cab), while a wide range of high-entry cab over models with peep windows and conventional cabs with sloped hoods are already available for incremental direct vision upgrades across agency fleet applications.

Cross-agency findings

- Identified as high priority for most agencies interviewed
 - Low entry cab-over, smaller footprint, bigger windshield and larger side windows desired
 - For example: DSNY reports it would like to migrate entire fleet from current conventional cab configurations to either low-entry cabover or to best available conventional cab designs, including medium duty trucks
 - Two agencies (DOC and DOE) also desire high-vision buses and medium-duty cargo vans
- Some agencies voiced concern about the procurement of high-vision vehicles, specifically mentioning that specifications may have to be researched and developed by DCAS to procure high-vision cabs without risking reduced competition or leading to sole-source vendors. DCAS will work with manufacturers to encourage the early adoption of various options.

Forward Collision Warning (FCW) and Pedestrian Collision Warning (PCW)

The previous “driver alert systems” category will be further clarified as “Forward Collision Warning (FCW) and Pedestrian Collision Warning (PCW),” so as to reflect how these alert systems are specifically intended to improve safety: warning of forward collisions with vehicles, other objects and people. FCW/PCW technology is different from automatic emergency braking (AEB) technology in that it makes the human driver of paramount importance, whereas AEB is capable of automatically engaging vehicle brakes if the driver does not respond to avoid an impending collision.

Pedestrian collision warning systems are becoming available factory-installed from some truck manufacturers. For example, Mitsubishi Fuso Trucks of America announced that Fuso FE and FG Series trucks would be available with factory-installed Mobileye 6 Series PCW beginning with the 2017 model year.

Per DCAS input, PCW systems are proposed to be included as a Tier 1 technology on new Class 1 and 2 vehicle purchases only. Class 3 and above are proposed as Tier 2.

Cross-agency findings

None noted.

Automatic Emergency Braking (AEB) Systems

Automatic emergency braking (AEB) serve as a last line of defense to avoid or mitigate a forward crash. AEB systems use LIDAR, radar, and/or camera technology to identify collision risks, taking into account a vehicle’s speed and trajectory. AEB is typically activated after an FCW/PCW system alerts a driver about a potential forward collision and the driver fails to respond. The AEB may apply either partial or full braking force. Some of the current AEB systems are designed to prevent collisions (up to certain speeds),

while others may be capable only of collision mitigation. While AEB for passenger and commercial vehicles operate similarly, differences in vehicle size and weight require the manufacturers of AEB components to consider differences in vehicle stopping distances. AEB systems are only available factory-installed on new vehicles.

All AEB systems can detect moving vehicles directly ahead in the current travel lane, but not all systems can detect pedestrians and other vulnerable road users. AEB systems that can detect vulnerable road users are known as Pedestrian AEB (PAEB). Current PAEB systems are more capable of detecting moving rather than stationary pedestrians or bicyclists, since these produce a recognizable radar signature; detecting stationary people generally requires camera-based and fusion systems. Additionally, certain systems use infrared sensors to detect pedestrians or workers, for example the aftermarket Global Sensor Systems rear AEB (RAEB) for heavy-duty trucks with air brakes.

Given the different technology maturity and availability levels of AEB systems for different use cases, and based on recent implementation successes documented among the NYC agency fleets, the two existing SFTP AEB entries are proposed to be split into five entries:

1. PAEB light-duty (Tier 1)
2. AEB medium/heavy (Tier 2)
3. PAEB medium/heavy duty (Tier 2)
4. RAEB for heavy-duty with air brakes (Tier 2)
5. RAEB for light-duty (Tier 3)

Given the wide variation in these five AEB systems' capabilities, limitations, and availability across vehicle types, it is important that drivers understand the systems on the vehicles that they operate. Operator orientation and/or training could be beneficial to address potential gaps between what drivers assume these AEB systems can do and what the five different systems are actually capable of.

PAEB light-duty

This update proposes to revise "Class 1-2 AEB" to "Class 1-2 PAEB," still factory-installed in new vehicles only wherever viable and available. The revised SFTP will employ PAEB as the preferred option for mandated implementations pending market availability and impact on market competition.

Based on Volpe's review of sources such as Consumer Reports, NHTSA, IIHS, and the European and Australian New Car Assessment Programs, there is widespread and growing PAEB availability on Class 1 and 2 vehicles. For example, 92% of new Toyota cars in 2018 shipped with the technology.⁵ Both the European and the Australian NCAPs have been testing vehicles for PAEB performance for a number of years, as the technology has grown more mature,⁶ and research strongly supports PAEB's benefits for fatality and injury reduction.⁷ For example, a 2016 NHTSA study performed by Volpe found that current, commercially available pedestrian AEB systems in cars can conservatively mitigate 5,000 vehicle-pedestrian crashes and at least 810 fatal vehicle-pedestrian crashes per year. Total police-reported car-pedestrian crashes that could be addressed by more robust future AEB systems amount to 21,090 per

⁵ <https://qz.com/1303581/what-will-stump-the-toyota-camry-automatic-braking-system/>

⁶ <https://www.euroncap.com/en/vehicle-safety/the-ratings-explained/vulnerable-road-user-vru-protection> and <https://www.ancap.com.au/understanding-safety-features>

⁷ https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/812400_pcambenefitsreport.pdf

year (out of 62,917 total), including about *two-thirds* (2,193 out of 3,337) of such fatal crashes.⁸ Looking at one specific model, IIHS recently found that Subaru’s EyeSight system has reduced likely pedestrian-related insurance claims by 35 percent.⁹ PAEBs with stereo camera or radar-camera “fusion” systems have also been found to be capable of stopping from the highest speed to avoid a crash (Figure 8).¹⁰

While PAEB is not uniformly available across OEMs, virtually all new Class 1 and 2a vehicles (under 8,500 lbs.) in the U.S. will have at least basic AEB by 2022 and virtually all Class 2b trucks (8,501-10,000 lbs.) will have at least basic AEB by 2025.¹¹ Clear demand for PAEB today from large fleets such as the NYC Fleet may help accelerate all OEMs’ inclusion of pedestrian detection in these AEB packages.¹²

Cross-agency findings (light duty)

- Light-duty PAEB considered among the Top 3 most important by DSNY, DPR, FDNY, DOC, DOHMH, TLC, and DEP. DCAS believes that the over 50 agencies that are typically referred to as the client fleet and mostly operate light duty vehicles would benefit most from light duty PAEB.
- Agencies did not express any major operational or procurement concerns

AEBs using stereo cameras or fusion sensors stopped to avoid a crash from the highest initial speed

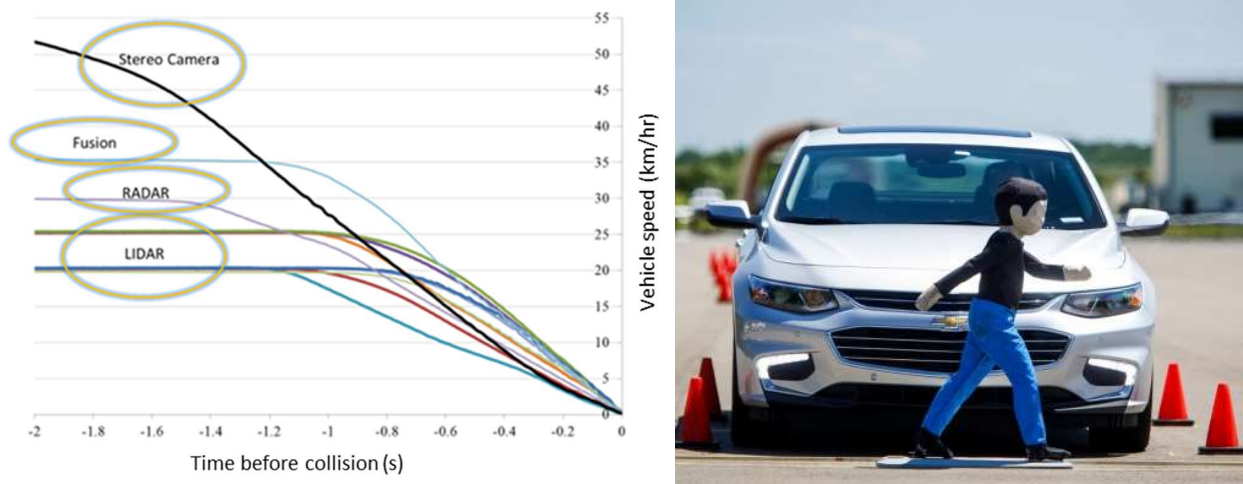


Figure 8: Stopping performance of different AEB systems on various passenger car models.

⁸ AEB addressable crashes were defined as crashes involve a light-vehicle striking a pedestrian with the front of the vehicle in the first event of a crash, with no avoidance maneuver.

⁹ <http://www.iihs.org/iihs/sr/statusreport/article/53/3/2>

¹⁰ <https://pdfs.semanticscholar.org/c9c3/c0143954772bae12516d4b30a3dfa895db6e.pdf>;

https://www.thatcham.org/files/pdf/AEB_FAQ.pdf

¹¹ Toyota is the frontrunner when it comes to having the largest number of 2017 vehicles with standard AEB. The automaker equipped 56 percent of its 2017 fleet — 1.4 of 2.5 million vehicles — with AEB. General Motors had the second-highest number of 2017 models with AEB — 551,777 of 2.8 million vehicles, representing 20 percent of its 2017 fleet. Honda was third-highest with 492,330 of 1.6 million vehicles with AEB, representing 30 percent of its 2017 fleet. <https://www.nhtsa.gov/press-releases/nhtsa-iihs-announcement-aeb>

¹² <https://consumersunion.org/news/consumers-union-automakers-making-progress-but-lifesaving-automatic-emergency-braking-technology-needs-to-be-better-become-standard-feature-faster/>

AEB medium/heavy

This entry remains unchanged. Currently there are at least three truck AEB suppliers in the U.S., also described in the following section, “PAEB medium/heavy.”

Cross-agency findings (medium-heavy duty)

- None noted

PAEB medium/heavy

This update proposes a new Tier 2 entry for factory-installed PAEB for new medium/heavy-duty vehicles.

Given the shorter history of truck PAEB technology, the evidence of truck PAEB safety benefit is less established but is emerging out of Europe. In 2015, the expansion of AEB to avoid or mitigate collisions involving pedestrians/bicyclists topped the list of measures considered likely to be cost-beneficial for possible future legislation by the EU in a Transport Research Laboratory report.¹³ The Volvo Trucks Safety Report 2017 finds that pedestrian-capable AEB or FCW could be relevant for preventing or mitigating about *40 percent* of crashes between large trucks and bicyclists or pedestrians in Europe.¹⁴

Based on Volpe industry interviews, the Detroit Assurance 4.0 PAEB system can detect moving pedestrians as well as bicyclists and apply up to one-third braking power to avoid a forward collision. In ideal conditions, the system will bring the truck to a full stop from speeds up to 25 mph, the default speed limit in New York City. The Wingman Fusion AEB can apply up to two-thirds of full braking power, including drive, steer, and trailer axle brakes. Meritor WABCO OnGuardActive AEB can apply up to half the braking power of the vehicle. In all systems, an AEB activation is accompanied by a distinct audiovisual alert from the LCD display.¹⁵ Based on review of the Wingman Fusion and Meritor WABCO systems’ published manuals and specifications, it appears that they *may* be able to detect pedestrians, cyclists, and other vulnerable road users, but that this capability is not currently advertised as implemented. Thus there appears to be one commercially available truck PAEB system at the time of writing, available on one make and up to two models.¹⁶

DCAS may wish to trial a heavy-duty vehicle with PAEB to validate its capability in the NYC environment, which is similarly dense to the European cities where trucks equipped with the Daimler Active Brake Assist 4.0 system (equivalent to the Detroit Assurance 4.0) have been in service for a number of years.¹⁷ As availability and capability (e.g., fusion sensors) of truck PAEB systems increases in future years, DCAS may consider elevating it to Tier 1. At this time, based on feedback regarding manufacturer issues with

¹³ <https://publications.europa.eu/en/publication-detail/-/publication/47beb77e-b33e-44c8-b5ed-505acd6e76c0>

¹⁴ <https://www.volvogroup.com/content/dam/volvo/volvo-group/markets/global/en-en/about-us/traffic-safety/Safety-report-170627.pdf>

¹⁵ https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/812280_fieldstudyheavy-vehiclecas.pdf

¹⁶ Freightliner Cascadia (starting 2017) and Freightliner EonicSD (starting 2018, though Moving Pedestrian Warning may not be initially implemented).

¹⁷ <http://media.daimler.com/marsMediaSite/en/instance/ko/Safe-on-all-roads--customers-trust-heavy-duty-trucks-bearing-the-star-Mercedes-Benz-Actros-with-new-Active-Brake-Assist-4-and-Sideguard-Assist-in-customer-operation.xhtml?oid=15511209>; https://roadstars.mercedes-benz.com/en_GB/magazine/route/03-2017/on-tour-with-safety-pack-and-sideguard-assist.html; <http://eurotransbudexpol.eu/en/we-are-testing-new-mercedes-actros.html>

incorporating sensors on snowplow-equipped vehicles, DCAS plans to allow for automatic braking deactivation on vehicles when they are used for snow clearance.

Cross-agency findings (medium-heavy duty)

- Several agencies reported this technology to be a top or “top 3” priority, including DPR, DSNY, DOC, and DEP. (DOC also expressed interest in PAEB for buses.)

RAEB for heavy-duty with air brakes

This update proposes a new Tier 2 entry for rear AEB for new and existing heavy-duty vehicles with air brakes, for collision avoidance in reverse operation.

In contrast to forward AEB, rear AEB (RAEB) has been available as an OEM or aftermarket safety technology for heavy-duty vehicles with air brakes for over 30 years. There is at least one supplier, Global Sensor Systems, which uses an infrared sensor and is installed in line with the air brakes. The system is turned on by placing the gear shift lever in reverse, and if an object is detected while backing up, the brakes automatically engage with an audiovisual warning to the driver.¹⁸

DSNY has been using this system on all EZ pack (front loader collection) units and reports that it has been a successful implementation for 20 years across 450 vehicles. Two other agencies (NYCDOT and DEP) have piloted implementation of the same system on vacuum and dump trucks.

Cross-agency findings (rear heavy duty)

- DSNY has implemented RAEB on 450 vehicles and has two decades of use experience
- DPR and DOC both expressed interested in piloting RAEB
- At least one agency cautioned that RAEB needs to be paired with driver training to mitigate the risk of overreliance

RAEB for light-duty

This update proposes to add a new Tier 3 entry for RAEB for new light-duty vehicles.

While Rear Automatic Emergency Braking (RAEB) systems are not prevalent in most 2018 model passenger vehicles (only available on 5 percent and standard on 1 percent), the technology is promising to avoid low-speed backing collisions. When implemented, insurance studies have found RAEB systems to reduce the frequency of property damage collisions. The Insurance Institute for Highway Safety reported that General Motors' rear autobrake system is reducing backing crashes reported to police by 62 percent, for example, and the organization evaluates RAEB systems by how it performs in a series of car-to-car and car-to-pole tests with different approach angles.¹⁹

As RAEB systems are not currently designed to detect pedestrians, bicyclists, children, etc.,²⁰ they may not offer immediate value in reducing traffic fatalities and injuries for Vision Zero, but they may be an effective means to reduce property damage costs. Based on Volpe’s research, DCAS believes this

¹⁸ <http://www.globalsensorsystems.com/index.asp>; <https://foresternetwork.com/msw-management-magazine/ms-waste/ms-recycling/cause-backing-hard/>

¹⁹ <http://www.iihs.org/iihs/news/desktopnews/rear-crash-prevention-ratings-aim-to-cut-parking-lot-collisions>

²⁰ <http://www.iihs.org/frontend/iihs/documents/masterfiledocs.ashx?id=2150>;
<https://my.cadillac.com/learnAbout/automatic-braking/2018/XT5>

technology will have a positive impact on the client fleets as well as agencies that operate large numbers of light duty vehicles in tight spaces such as parking lots and garages.

Cross-agency findings (rear heavy duty)

- Agencies expressed interest in saving costs from parking lot crashes

Backup Alarms

This update proposes to clarify and split the existing “smart backup alarms” entry into Tier 1 self-adjusting volume back up alarms and Tier 2 broadband backup alarms. Additionally, this update proposes to expand both technologies’ applicability to trailers.²¹

Whereas the SFTP originally combined two backup alarm features—self-adjusting volume and a broadband (or “white noise”) signal—further research on both the evidence of effectiveness and agency fleets’ level of experience suggested that these two features could be separately considered and implemented.

By collecting data on self-adjusting volume and broadband backup alarms separately, DCAS may also address gaps in knowledge about the two technologies’ safety benefits that other ongoing pilots (e.g., Ottawa) do not appear to be addressing.²²

Self-adjusting volume backup alarms

Self-adjusting volume backup alarms are designed to maintain detectability (generally >5 dB above ambient noise) while reducing noise on quieter streets, in parks, or at night. This technology is listed as a form of “Effective Noise Control during Nighttime Construction” by the Federal Highway Administration.²³ Moreover, Volpe found that most NYC agency fleets have either already adopted self-adjusting volume backup alarms and report that they are effective, or expressed a desire to incorporate such alarms.

Close attention should be given to the alarm's mounting location on the vehicle to minimize engine noise interference, which can be sensed by the alarm as the ambient noise level, as well as to potential muting of the alarm speaker by other vehicle components. These alarms should be mounted as far to the rear of the vehicle as possible.

Cross-agency findings

- Already in use by DSNY, DPR, FDNY, DOE
- Desired as a standard specification by certain other agencies, including DEP and DOHMH
- FDNY recommends plastic rather than metal alarm casings (due to corrosion) and advises careful installation to avoid muting the alarm with surrounding vehicle components

²¹ Most of the City’s trailers (about 30) are NYCDOT owned.

²² <https://www.cbc.ca/news/canada/ottawa/plows-back-up-alarms-pilot-1.4485464>;
<https://ottawa.ca/en/news/less-beep-more-woosh-piloting-new-back-alarms-snow-vehicles>

²³ https://ops.fhwa.dot.gov/wz/workshops/accessible/Schexnayder_paper.htm

Broadband Backup Alarms

With the exception of self-adjusting volume, the traditional “beep-beep” of tonal backup alarms has not changed since they were invented in 1963.²⁴ In the past decade, broadband backup alarms have come into wider use in the construction and to a lesser extent other trucking sectors. Broadband backup alarms, also called “white noise” alarms, emit a wider range of sound frequencies than tonal alarms.

Volpe undertook a literature review as well as interviews with two in-house psychoacoustics experts²⁵ on the safety benefits or risks of implementing broadband backup alarms on City Fleet vehicles. Based on this research:

- Compared to traditional tonal alarms, broadband alarms appear to be:²⁶
 - More **detectable** (“I hear something”)
 - If one frequency is masked, then other frequencies remain unmasked
 - More **localizable** (“where’s it coming from?”)
 - More uniform sound field--see Figure 9
 - Of variable **Perceived urgency** (“I need to act”)
 - Potentially lower **recognizability** (“that’s a backup alarm”), at least at first exposure
 - Of variable **annoyance**

This comparison is summarized below in Figure 9.

Of the four safety-relevant criteria, detection can be considered the most important, because if a person cannot hear an audible warning, that person cannot respond to it appropriately regardless of how localizable, urgent, and recognizable the sound may be. To determine relative importance of these four criteria, it would be necessary to analyze what happens in backing crashes involving City vehicles, even anecdotally.

According to one of the studies reviewed, the potential perceived urgency and recognizability advantages of tonal alarms over broadband alarms “would probably not overcome the adverse effect of major spatial variations in sound levels found over short distances behind a vehicle with this alarm (on the order of 15 to 20 dB), which are noticeably more pronounced than those generated by the broadband alarm.”²⁷ These spatial variations, which may mislead a person to think a tonal alarm is coming from another direction, are shown in Figure 9. Volpe’s research indicates that broadband alarms could be customized by manufacturers to increase their perceived urgency and recognizability.²⁸ Three

²⁴ https://web.archive.org/web/20111117093435/http://www.triton-signal.com/index.php?option=com_content&view=article&id=27&Itemid=32;

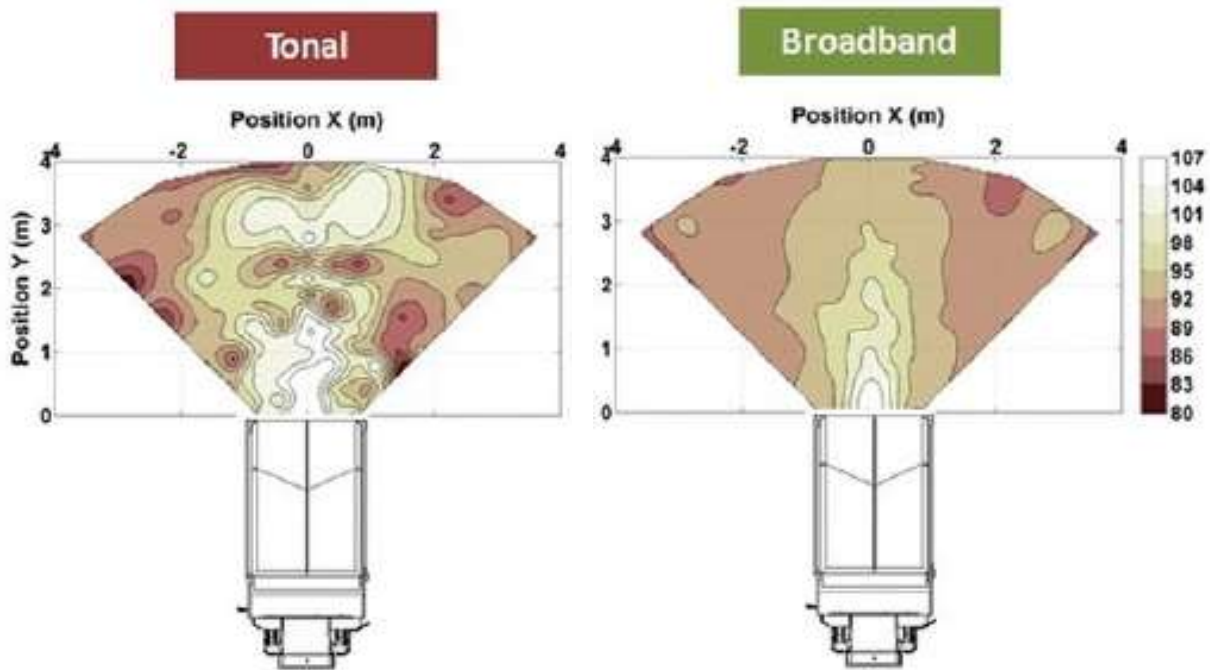
²⁵ Dr. Aaron Hastings and Dr. Gina Melnik

²⁶ https://www.researchgate.net/publication/283558564_Comparison_of_different_vehicle_backup_alarm_types_with_regards_to_worker_safety; <http://www.irsst.qc.ca/media/documents/PubIRSST/R-833.pdf>; <https://ottawa.ca/en/news/less-beep-more-woosh-piloting-new-back-alarms-snow-vehicles>; https://www.researchgate.net/publication/288270778_Evaluation_of_Annoyance_and_Suitability_of_a_Back-Up_Warning_Sound_for_Electric_Vehicles

²⁷ <http://www.noiseandhealth.org/article.asp?issn=1463-1741;year=2013;volume=15;issue=67;spage=420;epage=436;aulast=Vaillancourt>

²⁸ <https://www.oemoffhighway.com/electronics/sensors/proximity-detection-safety-systems/article/10166599/backup-alarms>

approaches would include shortening the time between pulses, adding discordant sounds, and combining broadband with tonal sounds.



Criterion	Tonal (traditional)	Broadband
Detection		
Localization		
Perceived Urgency		
Recognition		

Figure 9. Top: Broadband generates a more uniform sound field behind the vehicle that better allows people to know where the sound is coming from. Bottom: Comparison of tonal and broadband backup alarms by four criteria of audible warnings.

NYCDOT experience

After a number of fatal and serious-injury backing crashes, NYCDOT investigated a particular vendor’s broadband backup alarm as a possible solution to reduce the risk of further incidents. Retrofits were installed on a couple of vehicles for testing purposes in 2014. Since then, over 800 broadband backup alarms have been installed across every medium or heavy-duty truck in the NYCDOT fleet, from pickup trucks to Class 8, and the agency specifies the devices in all new vehicle purchases. At a high level, broadband alarms seem to be working: there have been no more backing crashes since the rollout began.

NYCDOT found that the broadband alarms were not as recognized at first as the tonal backup alarm sound, but now that they are more common, people recognize it. The agency recommends pairing broadband alarms with additional safety training and planning how to measure the success of the new technology’s rollout.

Cross-agency findings

- NYCDOT standard specification (per above)

- DSNY has completed a successful 6 month pilot; the operator reported broadband alarms worked better for the visually impaired.
- FDNY previously trialed broadband in 2011-2012; would advise any further testing/installation to be limited to amber light vehicles before going to red light ones
- Other agencies expressed interest in adopting or piloting, including DOC and DOE
- TLC expressed concern about the broadband alarms' perceived urgency

Connected Vehicle Technology

This update proposes to elevate Connected Vehicle Technology to Tier 2, given the 4,000+ DCAS vehicles that are being outfitted with DSRC devices for the New York City Connected Vehicle Pilot.

The pilot, which aims to improve the safety of road users through the deployment of V2V and V2I connected vehicle technologies, includes fifteen different applications that rely on Dedicated Short Range Communication (DSRC). The applications provide drivers with alerts so that the driver can take action to avoid a crash or reduce the severity of injuries or damage.²⁹ The pilot is underway as of August 2018 and is scheduled to continue through February 2020 with 8,000 vehicles, of which NYC Fleet is providing 4,000-5,000. Of the safety applications included in the pilot, two overlap with other technologies in the SFTP, as noted in **bold**:

- **Forward Collision Warning FCW**
- **Blind Spot Warning BSW**

Evaluating the performance of these and other safety applications on the NYC Fleet-supplied vehicles will be important for informing whether CV technology should be elevated to Tier 1 in the future.

Cross-agency findings

- Given limited experience with CV technology to date, agency feedback was also limited. However, at least two agencies expressed concerns that CV technology is not mature enough, may produce too many false positives, and may not be beneficial without more DSRC-equipped vehicle density

External Cameras and Recording

This update proposes to add external cameras (including but not limited to dashboard cameras) and recording devices as a Tier 2 best practice entry.

In addition to potential safety training, telematics integration, and coaching applications, external camera recording has been documented to save significant liability costs to the City when processing collision claims. For details, see Appendix C for the Dashboard and Other Cameras Case Study memorandum.

Universal Design

This update proposes to add Universal Design Accommodation as a Tier 3 entry.

Based on comments from the 2017 DCAS driver survey, some vehicle cabs are not currently compatible for all body sizes and types. This may pose a safety risk for shorter or heavier drivers for whom the seat

²⁹ <https://cnp.nyc/>

belt does not fit comfortably, the pedals are not at an ergonomic distance, or for whom a low seat and high dashboard/window sills combine to create larger blind spots.

Applied to vehicles, universal design is the concept that vehicle designs should be compatible with all users, under all environmental conditions, for all anticipated uses, and for all predictable modifications. Possible universal design solutions include high vision cabs, adjustable seat controls, and seat and seat-belt geometry modifications. Telescoping steering wheels and adjustable driver seats are available as a built-in feature on a number of vehicles. Aftermarket adjustments like pedal extensions can be made to vehicles to accommodate for driver height.

As examples of potential needs on the agency fleets, Volpe documented the following feedback:

- One agency always buys height adjustable seat belts when available, but would like all manufacturers to offer these
- Side visibility is an issue for one agency's Freightliner Sprinter vans, especially for the 5' 2" driver
- The same agency reports no pedal adjustments are available for these vans
- Ingress and egress can be difficult on vocational trucks for people outside the 5th-95th percentile sizes

Cross-agency findings

- While a number of agencies identified universal design issues, at least two indicated it is not a major issue for them
- NYPD has made height-adjustable seat belts a standard specification

Intelligent Speed Assistance (ISA)

This update proposes to add active intelligent speed assistance as a Tier 3 entry for future exploration and potential piloting.

Intelligent Speed Assist (ISA) is a safety technology that alerts drivers when they exceed the speed limit, which is 25 mph by default in New York City. ISA activates when a driver exceeds the posted speed limit for a section of road by a set speed (e.g. 2 mph or more). In *passive ISA*, audio and visual warnings activate to remind the driver that they are going too fast. In *active ISA*, as proposed here, ISA is also fitted with a speed limiting function that increases the pressure on the accelerator when the driver exceeds the posted speed limit, making it harder—but not impossible—to accelerate. This ability to temporarily accelerate above the posted speed limit for overtaking maneuvers in emergencies, as well as the real-time speed limit awareness, are what distinguish ISA from simple speed governors.³⁰

According to the European Transport Safety Council, "ISA is probably the single most effective new vehicle safety technology currently available in terms of its life-saving potential" and could cut road deaths Europe-wide by 20% with mass adoption.³¹ Several manufacturers now sell cars and light trucks in Europe and Australia with various implementations of ISA including Ford, Volvo, Hyundai, Jeep, VW, Mazda, Nissan, Toyota, BMW, Mitsubishi, Subaru, Honda, Audi, and Kia.³² Australia's advanced

³⁰ <http://www.howsafeisyourcar.com.au/Safety-Features/Safety-Features-List/Intelligent-Speed-Assist-ISA/>

³¹ <https://etsc.eu/briefing-intelligent-speed-assistance-isa/>

³² <https://www.euroncap.com/en/ratings-rewards/latest-safety-ratings/> (Filter for "Speed Assist Systems")

commercialization of ISA has in part been underpinned by initiatives from the state road authorities, and the inclusion of ISA in the National and State Road Safety Strategies.³³

Transport for London announced in 2016 that all new transit buses from 2017 will be fitted with ISA, based on a successful pilot on two bus routes. The trials were particularly effective when travelling through 20mph zones – which are being widely introduced and cover about a quarter of London’s roads – helping to ensure other vehicles in the area adhered to the limit.³⁴

While drivers initially have to adjust to using ISA technology, the ETSC reports that a majority of drivers (64%) rate it favorably. One benefit, as Ford has pointed out in a recent marketing campaign in the UK, is that it helps drivers avoid speeding tickets.³⁵ ISA could offer a similar benefit to agencies who report that some of their drivers currently speed in New York City’s photo-enforced school zones.

Further research will be needed to identify the current and future availability of the technology in the U.S., which has been under at least academic discussion since 2009.³⁶

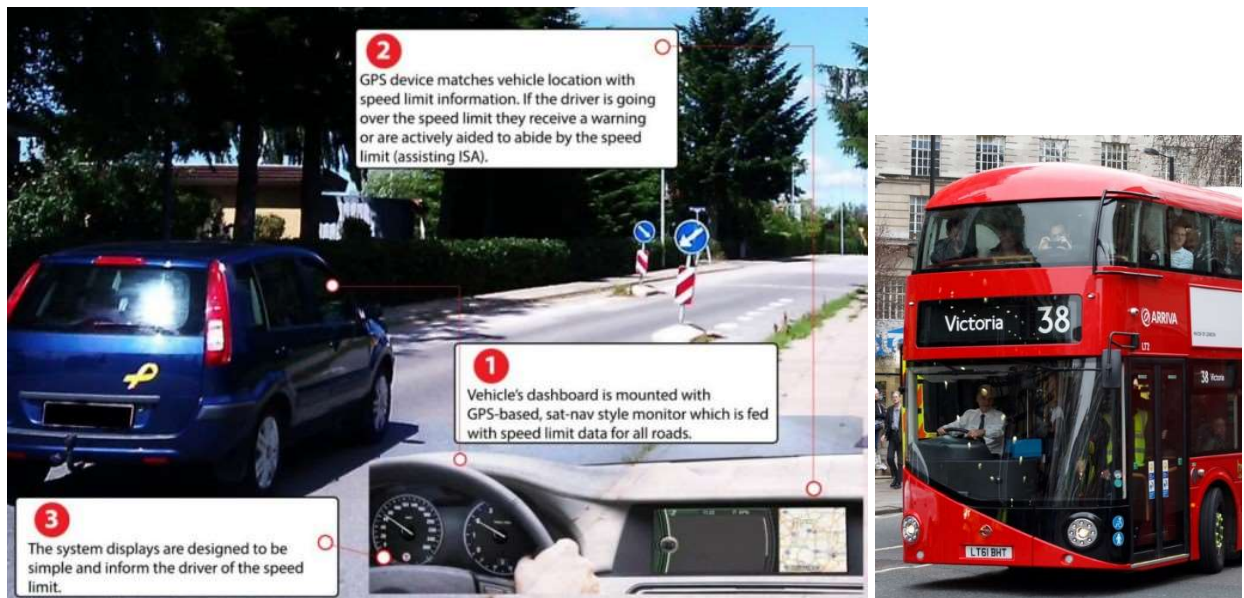


Figure 10. Left: Overview of ISA; Right: London bus equipped with ISA (sources: ETSC)

Cross-agency findings

- In discussing ISA as a safety technology for non-emergency vehicles, a number of agencies stated that ISA would be a highly desired feature. One agency in particular noted that speed violations near schools are a concern and that ISA would be a high priority.
 - Note: Whereas the general vehicle fleet is photo-enforced for speeding only in select school zones around the City, ISA is a tool that could potentially serve a similar purpose on City vehicles in all school zones.

³³ <http://roadsafety.gov.au/>

³⁴ <http://londonroadsafetycouncil.org.uk/londons-buses-to-be-fitted-with-speed-limiting-technology/>

³⁵ <http://social.ford.co.uk/could-this-spell-the-end-for-speeding-tickets/>

³⁶ <http://www.cts.umn.edu/events/luncheon/2009winter>

- One agency stated that its law enforcement vehicles may not be appropriate ISA candidates
- One agency raised the potential issue of ISA errors, e.g., when driving on a local street alongside a highway on a highway adjacent to a local street.
 - Note: ETSC addresses this issue as follows: “ISA is a driver assistance technology: the driver, not the car, is responsible for obeying the current speed limit at all times. In the limited number of cases where the car limits the speed incorrectly to a lower speed than is actually permitted, the driver would be able to override. Conversely, if the vehicle sets the limit higher than is actually permitted, then the driver would be responsible for ensuring that he or she does not exceed the speed limit.”³⁷

Other considerations

Additional research findings for several technologies that are not proposed to be added or revised are presented in the following sections.

Training in appropriate use of technologies, as a best practice option, where feasible and needed.

This update adds further detail to training in appropriate use of technologies.

The proposed new detail is based on feedback from several agencies and based on Volpe’s continuing research, which indicates that many advanced driver assistance systems require user training for maximum effectiveness. There are documented risks of complacent drivers placing too much trust in new safety technologies and failing to recognize their limitations. For example, initial research indicates that some drivers who become used to blind spot monitors may no longer check the side mirrors or look over their shoulders before turning, potentially leading to new crashes.³⁸ Other research suggests that drivers can over-rely on pedestrian collision warning systems. Training and driver resources may be needed to ensure drivers maintain the same or better situational awareness when introducing advanced safety technologies to a fleet.

Training programs may also prepare drivers for unexpected events, such as unintentional activation of PAEB. For example, as automobile manufacturers make clear, the brakes can be accidentally activated if the driver approaches pedestrians in a crosswalk too quickly. In this case, a training-based solution is to train drivers to brake sooner and farther in advance of the crosswalk whenever people are present—an appropriate safety practice in and of itself.

³⁷ <https://etsc.eu/briefing-intelligent-speed-assistance-isa/>

³⁸ <https://www.insurancebusinessmag.com/us/news/technology/car-safety-systems-have-potential-but-could-turn-drivers-complacent-studies-78094.aspx>



Figure 11. VR-based driver training.³⁹

Traditional, classroom-based defensive driving courses are unlikely to prepare drivers for optimal use of new safety technologies, but training drivers on public roads can be time-consuming and potentially risky for learning the limits of some technologies such as PAEB. Virtual reality (VR) simulators represent one potential solution to combine the realism of in-the-field training with repeatable and high-risk scenarios that would normally be discussed in a classroom. Further analysis would be needed to prioritize which approach may be most effective for improving safety (and most cost-effective) for the different types of technologies in the SFTP.

Cross-agency findings

- Agencies stated that they recommend additional training to help drivers not over-rely on sensors; they stated that driver training should emphasize more than it currently does how to use in-vehicle safety technologies.

Surround cameras

Volpe attempted to identify any recent research on the effectiveness of surround cameras systems and collected feedback from the agency fleets. Based on Volpe's review, there does not appear to be a large body of studies or major pilots of this technology. It would therefore appear premature to conclude that the collision avoidance benefits of surround camera systems as currently implemented outweigh potential distraction risks. For example, a Transport for London survey of 83 truck drivers concluded that surround cameras "have the potential to simultaneously be the most useful and the most distracting."⁴⁰

³⁹ VR driving school - motion platform - Oculus DK2 <https://www.youtube.com/watch?v=IRCqg5eWpYA>

⁴⁰ <http://www.clocs.org.uk/wp-content/uploads/2014/03/1593-TfL-Driver-Distractions-report-v2.0-10012014.pdf>

	Have fitted to vehicle	Considered useful	Considered essential	Considered distracting
Side guards/skirts	✓ 94%	✓ 75%	✓ 82%	✗ 1%
Reversing beepers/alarms	✓ 94%	✓ 83%	✓ 80%	✗ 6%
Blind spot elimination mirrors/fresnel lens	✓ 89%	✓ 80%	✓ 77%	✗ 8%
Side sensors/side scanning system	✓ 71%	✓ 64%	✓ 53%	✗ 12%
Near side turning warning/side chat	✓ 71%	✓ 59%	✓ 59%	✗ 13%
Side marker lights	✓ 67%	✓ 75%	✓ 83%	✗ 2%
Cameras:				
Forward facing/recording	✓ 55%	✓ 59%	✓ 55%	✗ 5%
Near side blind spot	✓ 47%	✓ 51%	✓ 54%	✗ 7%
All round	✓ 51%	✓ 51%	✓ 54%	✗ 4%
Reversing	✓ 75%	✓ 77%	✓ 73%	✗ 2%

Base: All survey respondents (83 drivers)



Figure 12. Review of 83 truck drivers' reported experiences with seven types of safety technologies, including "all around" cameras.

Cross-agency findings

Pilot programs of 360-degree cameras are underway at DSNY and DOC. Driver distraction is the primary concern in the DSNY pilot so far, although the agency states the technology has potential safety value if designed well. FDNY also reported issues related to driver distraction in their surround camera testing.

Navigation systems

Vehicle navigation can be one of the most distracting tasks for drivers. Although smartphones are the primary source of navigation systems for most drivers, City drivers are not permitted to use mobile devices when actively driving and operating a City vehicle.⁴¹ In-vehicle navigation systems may be less distracting than smartphone-based navigation,⁴² but Volpe did not identify a significant body of literature on optimal navigation systems that minimize driver distraction. A AAA Foundation study of in-vehicle display systems in 30 different new car models concluded that entering navigation is the most attention-demanding task:⁴³

“The best mode of interaction for audio entertainment and calling and dialing was the auditory vocal interface, whereas the best mode of interaction for text messaging was the center stack interface. **There was no good mode of interaction for the navigation task.** In all cases, **the navigation task took the longest time to complete** and this was **most pronounced with the auditory vocal interaction modality.**”

⁴¹ https://www1.nyc.gov/html/dcas/downloads/pdf/fleet/hands_free_policy_memo.pdf

⁴² <https://www.infopulse.com/blog/modern-car-navigation-systems-and-their-features/>

⁴³ http://publicaffairsresources.aaa.biz/wp-content/uploads/2017/09/CDST_Final_Report.pdf

To research and develop future vehicle purchase specification for a minimally distracting navigation system solution available on the market today, at least the following attributes may need to be considered:⁴⁴

- No menus
- No touch operations
- Minimal vocal interaction

It may also be appropriate to require any portable devices used for navigation to be mounted in a bracket, in the manner of Australian GPS laws,⁴⁵ or to consider an interlock system that locks out entering destinations except when the vehicle is placed in park.

Navigational systems may also be implemented as part of operational and logistical routing initiatives. Continued review of navigational systems could also explore the need (if any) for citywide solutions for routing and logistics that would cross different agency functions.

Cross-agency findings

Central Vehicle Screens as component of navigational systems: Distracted driving from multiple screens and personal phones is a large concern expressed by many fleets including DS, DOE, and DEP. A centralized screen connected with multiple applications (navigation and cameras) would be useful in medium- and heavy-duty vehicles.

Side-visible turn signals

Longer vehicles without side turn signal repeaters that are visible to a pedestrian or bicyclist near the side of the vehicle cannot communicate to that person that the vehicle is about to turn, which can increase the likelihood of a crash. While many large vehicles in the agency fleets already have turn signal repeaters mounted on their left and right sides and on the rear of the steering axle fenders, etc., “side-visible turn signals” were included in the original SFTP to make this a standard specification across all large City vehicles. See Figure 13.

Two additional approaches for how this Tier 1 entry can be refined and implemented are provided below.

⁴⁴ <https://www.sciencedirect.com/science/article/pii/S1877050914012149>

⁴⁵ <https://www.choice.com.au/transport/cars/navigation-systems/buying-guides/navigation-device>



Figure 13. Side-visible turn signals on a Parks truck (left) and an audio-visual turn signal tested by NYCDOT (right).

City of Somerville, MA ordinance

The ordinance, which applies to City-contracted large vehicles and was enacted in 2017, states:

“Large vehicles must be equipped with at least one turn signal lamp on each of the left and right vehicle sides that is visible from any point to the left and right of such large vehicle along the vehicle’s full length.”⁴⁶

FMVSS 108 and ECE regulations

Under the minimum U.S. requirements in FMVSS 108, the turn signals need not be visible from the side of the vehicle, although the standard permits flashing side marker lamps that provide lateral signal visibility. ECE regulations require a side turn signal repeater that is visible to the side and rear, as shown in Figure 14. Either the middle panel (U.S. optional) or right panel (European required) geometries could serve as the basis for determining sufficient side visibility of side turn signal repeaters on applicable City vehicles. The greater rearward visibility of the European side turn signal repeater geometry may offer bicyclists traveling parallel to a large vehicle more visibility of the turn signal, however further research would be needed to confirm this point.

46

http://somervillecityma.igm2.com/Citizens/Detail_LegiFile.aspx?Frame=&MeetingID=2393&MediaPosition=&ID=15358&CssClass=

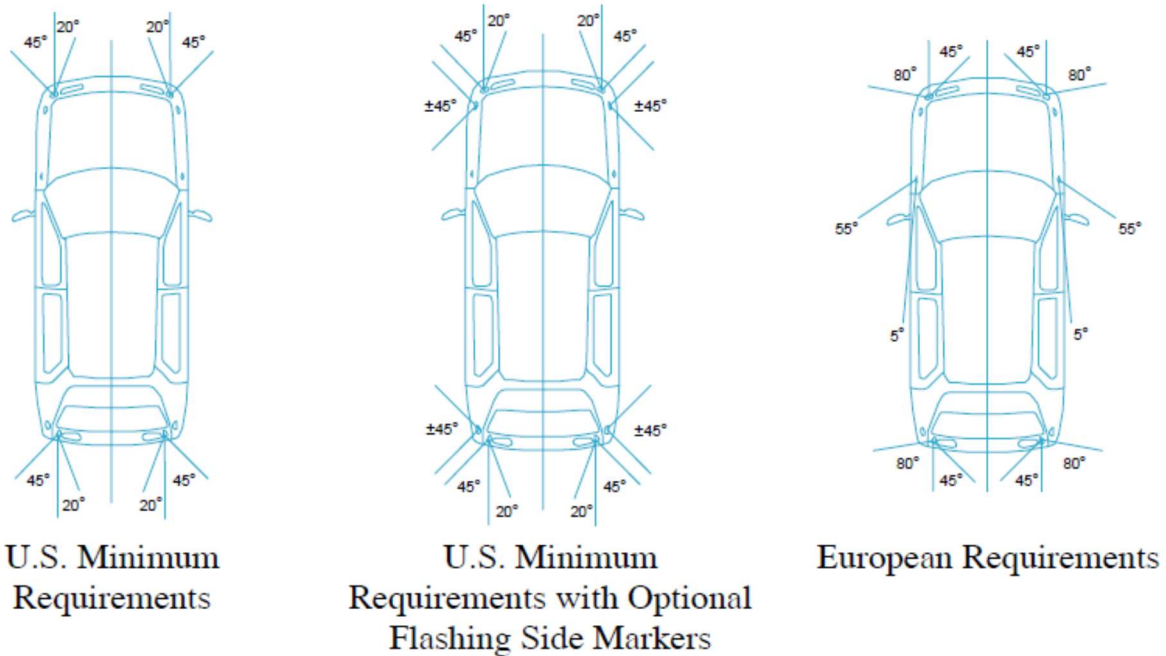


Figure 14. Schematic illustration of turn signal visibility and photometry requirements in U.S. and European cars.

Telematics and automatic emergency response

Telematics systems collect data of vehicle diagnostics, vehicle tracking, and driver behavior to allow for fleet management. GeoTab® is one of the major telematics platforms and is currently being installed on all City vehicles. Although capture of AEB activation data is not currently a default report, Volpe’s discussion with GeoTab® indicates the service may be able to capture AEB activation upon request.

Further discussion would be needed to determine the potential for Geotab to provide A) navigational services; B) direct audio alerts; and C) direct communication services.

GeoTab® does not currently include automatic emergency response services. However, automatic emergency response services appear to be available as a built-in feature on most light-duty vehicles with a monthly charge, as well as through an aftermarket feature (Automatic Pro, Hum+). See Appendix A.

Discussion and Conclusions

This memorandum of proposed updates to the SFTP follows the June 2018 presentation to the specification writers committee and analysis of feedback from 10 major agency fleets. This memo is intended to inform DCAS’s annual update of the SFTP technology designations for 2018-2019, while continuing to monitor technological developments in vehicle safety that can advance Vision Zero.

Procurement resourcefulness and collaboration will be key to pilot and implement certain technologies. Multi-year contracts, in particular for MD/HD vehicles, may make it more challenging to add in new technologies as they becomes available mid-contract. Developing these options is beyond the scope of the current memo but is recognized as an important need.

A further consideration is the need for appropriate integration of various systems and offerings to reduce redundancy and potential added distraction. For example, as pointed out by a number of agencies, the same display screen can serve to display backup cameras, driver alerts, telematics information, speed alerts, navigation, etc.

In adapting and implementing the findings of this memo for its SFTP update, DCAS may choose to either defer elevating technologies to a higher tier until exception requests are unlikely; or choose to elevate technologies more rapidly while allowing—and expecting to potentially receive more requests for—exceptions.

Appendix A: Automatic Response Services

- **Built In** Automatic Emergency Response Services
 - OnStar GM: <https://www.onstar.com/us/en/home/>
 - \$25 per month (First 3 months free deal is common)
 - Ford – 911 Assist: www.911assist.ford.com
 - SiriusXM Connected Vehicle Services
 - Hyundai – BlueLink: www.hyundaiusa.com/bluelink/
 - Kia – UVO/911 Connect: www.kia.com/us/en/content/technology/uvo/introducing-uvo
 - BMW – Assist: www.bmwusa.com/bmwassist
 - Toyota – SafetyConnect: www.toyota.com/safety-connect/
 - Lexus – Enform: www.lexus.com/enform/
 - Mercedes – mbrace: www.mbusa.com/mercedes/mbrace
 - Nissan – NissanConnect: www.nissanusa.com/connect
 - Infiniti – InTouch: www.infinitiusa.com/intouch
 - Chrysler – uconnect: www.driveuconnect.com/support/chrysler/
 - Volvo – Volvo On Call: www.volvocars.com/intl/services/apps-and-services/volvo-on-call#
 - Acura – AcuraLink: owners.acura.com/acuralink/nextgeneration
 - Subaru – Starlink: www.subaru.com/engineering/starlink.html
 - Volkswagen – Car-Net: http://volkswagen-carnet.com/int/en/start/app-overview/security-service/sas_emergencyservice.html#tab/open/f510ac77-eb02-4936-9796-776b5beeb6ee
 - Honda – HondaLink Assist <https://www.honda.ca/hondalinkassist>
- **Aftermarket** Automatic Emergency Response Services
 - OnStar FM: <https://www2.onstar.com/web/fmv/vehicle-compatibility?g=1>
 - Program DISCONTINUED IN 2016
 - “OnStar FMV is designed for automobiles and is not compatible with other motorized vehicles”
 - Hum by Verizon: <https://www.hum.com/>
 - Hum+
 - \$80 Hardware (Plug in Reader and Speaker) and \$10 monthly
 - Emergency Assistance, Vehicle Diagnostics, Navigation
 - Connects with phone and desktop for tracking
 - Automatic Pro: **Aftermarket** plug in. Tracks brakes, speed, automatic emergency

- <https://automatic.com/> \$129.95
- Automatic adapter plugs into just about any car’s standard diagnostics (OBD-II) port. Connects with smart phone
- Crash Alert is unavailable if the adapter is damaged, Bluetooth® is disconnected, the adapter is dislodged from the OBD port, or if there is no cellular or GPS signal.

Appendix B: Cabover Safety

Recent U.S. cab-over versus conventional fatality statistics, as published by the National Highway Traffic Safety Administration and based on the Trucks Involved in Fatal Accidents database, indicate that modern cab over engine (COE) trucks and conventional cab trucks are similarly safe for their drivers in crashes.⁴⁷ In 2015, the driver fatality and severe injury rate in conventional cab crashes wearing a seat belt was 10.7, compared to 12.9 for cab-over trucks. In Class 7 and 8, conventional cab trucks actually had *higher* driver risk than cab-over trucks when the driver was wearing a seat belt (9.8 vs. 7.0). Communicating to drivers that cab-over trucks are similarly safe to conventional cab trucks while providing greater maneuverability and visibility on city streets can support adoption and help to overcome driver safety concerns dating from the 1970s and 1980s, when cabover driver fatality risk was over 50% higher.⁴⁸

Table 1 Percent Probability of K- or A-Injury by Cab Style, Belt Use, and GVWR Class

Truck type	Conventional		COE	
	Belt	No belts	Belt	No belts
Class 3-6	15.1	60.5	20.3	70.6
Class 7, 8	9.8	56.9	7.0	55.1
All trucks	10.7	58.0	12.9	60.8

Appendix C: Dashboard and Other Cameras Case Study

[Attach]

Appendix D: TfL Direct Vision Standard

This appendix provides a brief summary of Transport for London’s Direct Vision Standard. For official and complete details, TfL provides a summary website.⁴⁹

⁴⁷ https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/812061_heavytruckinjurycountermeasures.pdf

⁴⁸ (Table 1)

<https://deepblue.lib.umich.edu/bitstream/handle/2027.42/907/81896a12.0001.001.pdf?sequence=2&isAllowed=y> (Table B-2)

⁴⁹ <https://tfl.gov.uk/info-for/deliveries-in-london/delivering-safely/direct-vision-in-heavy-goods-vehicles#on-this-page-6>

- TfL's Direct Vision Standard is scheduled to become a rule in October 2019, when safety permits are expected to start being issued;
- Safety Permits will be required for truck entry to London starting October 2020, and zero-star trucks will be banned unless they incorporate a package of "Safe System" technologies to help compensate for poor direct vision;
- The European Commission's [May 2018 review](#) of the General Safety Regulation, which governs European vehicle safety and design regulations, included Direct Vision Standard. If adopted, the European DVS will require high vision cabs Europe-wide starting in seven years on new trucks after it goes into effect.

Given the feedback Volpe received from fleet agencies about limited current availability of high vision cabs, DCAS may wish to consider the Manufacturer Challenge that TfL ran in 2014 to help bring OEMs on board. See page 32 of this document: https://www.clocs.org.uk/wp-content/uploads/2017/03/FINAL_CLOCS-Report-Web-LOW-RES-SPREADS.pdf

- The Prior Information Notice called for vehicle manufacturers to commit to producing new specification vehicles and/or vehicle modifications that increased driver direct vision. A financial match-funding contribution was offered by TfL as incentive. The Construction Logistics and Community Safety (CLOCS) operator delegation also offered an incentive of matchmaking new specified vehicles with London fleet operators to ensure the vehicles would be operationally trialed and evaluated. Responses to the PIN came from Mercedes, DAF, Dennis Eagle, Scania and Volvo.